Microbiologist develops soil test for EPA

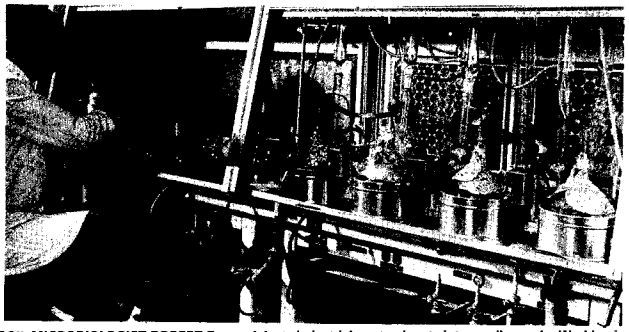
by Terry Smith, EG&G Idaho

EG&G Idaho is assisting the Environmental Protection Agency in developing an uncomplicated test for evaluating the effects of industrial contaminants on soil systems.

Research has shown that industrial products and wastes can interfere with the natural microbiological processes occurring in soil, such as nitrogen cycling, a process essential to plant growth. While tests already exist to help determine the effects of contaminants on soil systems, these are typically expensive and time consuming.

"The EPA is looking for economic and efficient tests that can quickly show the biological impact that contaminants have on soil systems," explains Robert Rogers, a soil microbiologist with the Earth and Life Sciences Office, EG&G Idaho.

Rogers is working on a project funded by the EPA Office in Las Vegas, Nev. He has developed a "Hydrogen Oxidation Soil Bioassay" and is currently doing research to document his results. The EPA is considering using this test as a first-line indicator of the adverse effects of contaminants on soil systems.



SOIL MICROBIOLOGIST ROBERT Rogers injects industrial contaminants into a soil sample. Working in a laboratory at TRA, Rogers is developing an uncomplicated soil screening test for the Environmental Protection Agency. (Photo by John Capek, EG&G Idaho.)

Hydrogen Oxidation is a process where microorganisms in soil convert hydrogen gas into water. Rogers' research has shown that contaminants such as silver, mercury and cadmium, present in quantities as low as one part per million, can interfere with the microorganisms' ability to do this.

The test involves introducing known quantities of contaminants into soil samples contained in a stoppered glass flask. Tritium gas, an isotope of hydrogen, is then injected into the flask as a tracer. After two hours, the soil is heated and the water it gives off collected by distillation. The water is then analyzed to determine the amount of tritium present. This amount, compared with the quantity of tritium originally introduced, shows what effect the contaminant had on the microorganisms' ability to oxidize hydrogen.

While the test does not directly show the effects the contaminants have on other natural microbiological processes, it infers that there has been some environmental impact on the soil system.

The main advantage of the test is that it can be quickly and easily done and involves the use of a small amount of equipment. "This is a biological process that we can analyze and have verifiable results in less than 24 hours," says Rogers.

"I think the real importance of this test is that it gives an early warning that there's a biological impact on the soil system," he says.

Shipment of SDS liner marks milestone for TMI program

by Rita Scott, EG&G Idaho

On Dec. 31, 1982, a major milestone was reached in the Department of Energy's Program at Three Mile Island. A shielded transportation cask containing a liner with more than 100,000 Ci of radioactive cesium, strontium and daughter products was shipped to the Department of Energy's Pacific Northwest Laboratories for waste immobilization studies.

This event was also the culmination of a concentrated effort on the part of a number of federal agencies, national laboratories, government and private contractors and General Public Utilities (GPU).

The shipment was the first of 12 highly loaded Submerged Demineralized System liners which will be shipped with catalyst for recombination of gases generated by radiolysis. The SDS was used to remove very high concentrations of radionuclides from 650,000 gallons of water that collected in the basement of the TMI-2 reactor containment building during the March 1979 accident. (The SDS cleanup system works much like a home water softener.)

Filled with zeolite for exchange material, the liner (2-1/2 ft. in diameter and 4-1/2 ft. tall) held 112,600 curies of radioactivity—more than 1/5 the total radioactivity removed from the water. This and the remaining liners will be used by DOE for research and evaluation at national laboratories in Richland, Wash. on methods of safely immobilizing and storing radioactive wastes.

According to Harold Burton, manager of EG&G Idaho's TMI/TIO office, DOE set the shipment of the SDS liners as a high priority at the outset of the recovery program. (Another high priority successfully accomplished was the shipment to INEL of EPICOR II liners which processed contaminated water in the plant's auxiliary buildings.)

"This is an outstanding example of how the DOE's technology and personnel are assisting in the solution of unique technical problems arising out of the cleanup at TMI," says Willis Bixby, DOE's resident site manager at TMI.

Major concerns confronting those involved in this particular phase of the recovery effort were finding a system that would decontaminate the water, devising a safe and legal method of preparing liners for shipment, and developing and demonstrating a satisfactory waste immobilization process.

GPU designed the SDS with the assistance of a DOE task force which recommended a mixture of synthetic zeolites as the ion-exchange material. The design was then tested in laboratory-scale experiments at the agency's Oak Ridge National Laboratory.

Burton says that DOE assistance was also valuable when it was discovered that a combustible gas was forming in the liners and they couldn't be transported in that condition. "The DOE laboratories in Richland designed, developed and tested a vacuum system to remove water from the liners and a catalyst system to recombine the gases," he says.

Safety and environmental assessments for the cask shipment from TMI were done by EG&G Idaho's Waste Programs Division with support from Safety and Earth and Life Sciences; DOE Safety Division personnel performed similar work for its receipt at the Richland laboratories. DOE also coordinated transportation arrangements for the shipment through Al Anselmo of EG&G Idaho and the GPU transportation departments. Technical coordination of liner preparation, shipment and waste immobilization studies at Richland (which converted the waste into a stable glass log), was handled by Geoff Quinn at TMI, and in the early stages by Jim Pletscher.

"Special recognition really belongs to the program manager, Thomas Runion, who coordinated this complex project," says Burton, also noting the many organizations who helped in the project; DOE-HQ, DOE-Richland, DOE-ID, NRC, ORNL, Westinghouse Hanford Co., Rockwell Hanford Operations, Chem Nuclear Corp., GPU and EG&G Idaho.

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Editor ..... Marijo Holmes

Secretary ..... Una Tyng

CORRESPONDENTS

EBCO, John Orr ..... Ext. 1573
ANL-W, Ed Hahn ..... Ext. 7917
M-K, Dennis Blair ..... Ext. 3472
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